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## PERFORMANCE SPECIFICATION

### RESISTOR, VARIABLE, (WIRE-WOUND POWER TYPE), GENERAL SPECIFICATION FOR

This specification is approved for use by all Departments and Agencies of the Department of Defense.

#### 1. SCOPE

1.1 Scope. This specification covers the general requirements for power type variable resistors having a resistance element of wire, wound linearly on an insulating strip shaped in an arc, such that a contact bears uniformly on the resistance element when adjusted by a control shaft. The power rating (see 3.1 cover a range from 6.25 watts to 1,000 watts, inclusive (see 6.2).

#### 1.2 Classification.

1.2.1 Part or Identifying Number (PIN). The PIN shall be in the following form and as specified (see 3.1):

RP06	2	SB	252	KK
Style (1.2.1.1)	Electrical off position (1.2.1.2)	Shaft and type of mounting (1.2.1.3)	Resistance (1.2.1.4)	Resistance Tolerance (1.2.1.5)

1.2.1.1 Style. The style is identified by the two letter symbol "RP" followed by a two digit number. The letters identify power type, wire-wound variable resistors and the number identifies the size and power rating.

1.2.1.2 Electrical off position. The existence and location of an electrical off position at one end of the resistance element is indicted by a single digit, in accordance with table I.

TABLE I. Electrical off position.

Symbol	Electrical off position
1	No electrical off position
2	Electrical off position at end of rotation of control knob in a counterclockwise direction
3	Electrical off position at end of rotation of control knob in a clockwise direction

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FSC 5905

1.2.1.3 Shaft and type of mounting. The style of shaft, type of mounting, and length of shaft is identified by two letter symbol. The first letter indicates the style of shaft and type of mounting and the second letter indicates the length of the shaft, in accordance with tables II and III, respectively.

TABLE II. Style of shaft and type of mounting.

Symbol	Style of shaft	Type of mounting				
		Bushing				Two hole
		.125 inch diameter shaft		.250 inch diameter shaft		.375 inch diameter shaft
		Standard	Locking	Standard	Locking	
F	Flatted			X		X
S	Slotted	X		X		
T	Flatted				X	
U	Slotted		X		X	

1.2.1.4 Resistance. The nominal resistance value expressed in ohms is identified by a three digit number; the first two digits represent significant figures and the last digit specifies the number of zeros to follow. When fractional value of an ohm, and values of less than 10 ohms are required, the letter "R" is substituted for one of the significant digits to represent the decimal point. When the letter "R" is used, the succeeding digit becomes significant. The following is an example: 3R0 signifies that the resistance value is 3.0 ohms. The nominal total resistance values shall be as specified (see 3.1).

TABLE III. Length of operating shaft.

Symbol	Standard length of shaft measured from mounting surface of resistor						
	Flatted			Slotted			
	.250 inch diameter shaft		.375 inch diameter shaft	.125 inch diameter shaft		.250 inch diameter shaft	
	Standard bushing	Locking bushing	Two hole mounting	Standard bushing	Locking bushing	Standard bushing	Locking bushing
A	Inches 1/	Inches 1/	Inches 1/	inches 1/	Inches 1/	Inches 1/	Inches 1/
B				0.625	0.625	0.500	0.625
D	0.875	1.250	0.875		0.875	0.875	1.250
G							
H	1.500		1.500	1.500		1.500	
J	2.000		2.000	2.000		2.000	
K	2.500 2/		2.500 2/	2.500		2.500	
N	4.000		4.000				
R	6.000		6.000				
S				0.375			

1/ Tolerance shall be  $\pm 0.0469$ .

2/ This shaft shall be flatted to within 0.156 inch of the mounting bushing (or mounting surface if no bushing is present).

1.2.1.5 Resistance tolerance. The resistance tolerance in percent is identified by two letters, in accordance with table IV.

TABLE IV. Resistance tolerance.

Symbol	Resistance tolerance
	Percent ( $\pm$ )
KK	10

## 2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks, form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation (see 6.2).

## SPECIFICATION

## MILITARY

MIL-R-39032 - Resistors, Packaging of.

## STANDARDS

## FEDERAL

FED-STD-H28 - Screw Thread Standards for Federal Services.

## MILITARY

✓MIL-STD-202 - Test Methods for Electronic and Electrical Component Parts.  
 ✓MIL-STD-810 - Environmental Test Methods and Engineering Guidelines.  
 MIL-STD-1276 - Leads for Electronic Component Parts.  
 ✓MIL-STD-1285 - Marking of Electrical and Electronic Parts.  
 MIL-STD-45662 - Calibration Systems Requirements.  
 MS35333 - Washer, Lock, Flat Internal Tooth.

(See supplement 1 for list of associated detail specifications.)

(Unless otherwise indicated, copies of federal and military specifications, standards, and handbooks are available from the Standardization Documents Order Desk, Building 4D, 700 Robins Avenue, Philadelphia, PA 19111-5094.)

2.3 Order of precedence. In the event of a conflict between the text of this document and the references cited herein (except for related associated detail specifications, specification sheets, or MS standards), the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

## 3. REQUIREMENTS

3.1 Associated detail specifications. The individual part requirements shall be as specified herein and in accordance with the applicable associated detail specifications. In the event of a conflict between requirements of this specification and the detail specifications, the latter shall govern (see 6.2).

3.2 Qualification. Resistors furnished under this specification shall be products which are qualified for listing on the applicable qualified products list at the time set for opening of bids (see 4.4 and 6.3).

3.3 Material. The material shall be as specified herein. However, when a definite material is not specified, a material shall be used which will enable the resistors to meet the performance requirements of this specification. Acceptance or approval of any constituent material shall not be construed as a guaranty of the acceptance of the finished product.

3.4 Design and construction. Resistors shall be of the design, construction, and physical dimensions specified (see 3.1).

3.4.1 Windings. The resistance element shall consist of a winding of resistance wire or ribbon (see 3.4.1.1) on a suitable form which shall not char or break down at any combination of temperatures and loads specified herein. The resistance element shall be wound in manner to preclude the possibility of shorting of turns. Joints, welds, and bonds shall be held to an absolute minimum. The wire shall be securely set on the form so as to avoid lateral displacement or bunching under action of the contact arm. The insulating coating between the wires shall be below the contact surface of the winding.

3.4.1.1 Resistance wire. The resistance wire shall possess a uniform cross sectional area of conductor. The cross sectional area of the wire shall be the maximum consistent with other requirements of this specification. The wire or ribbon thickness before winding shall be no less than 0.0025 inch nominal (0.0024 inch absolute minimum); the wire diameter or ribbon thickness after winding shall be no less than 0.0022 inch.

3.4.2 Rotating contact. Contact pressure on the resistance element shall be maintained uniformly by positive pressure and shall be such as to permit smooth electrical and mechanical control of the resistor over the effective rotation. The movable contact shall have continuous electrical contact with its terminal throughout the entire mechanical rotation and shall be electrically insulated from the operating shaft. The entire contact arm shall be sufficiently sturdy to preclude the necessity of adjustment during the life of the resistor. The effective rotation is the angular displacement of the operating shaft which is effective in producing useful change of resistance. The mechanical rotation of the operating shaft of the resistor is the total angular displacement between fixed stop points.

3.4.3 Operating shaft. Operating shaft shall be of metal construction.

3.4.3.1 Size. The diameter and length of the operating shaft shall be as specified (see 3.1 and tables II and III).

3.4.3.2 Flatted shaft (when applicable)(see 3.1). Flatted shafts shall have their flatted surfaces within  $\pm 3^\circ$  of being diametrically opposite the contact arm. The flatted surface with the exception specified in footnote 1/ of table III shall have a minimum length of 0.625 inch for resistors with a higher power rating of 150 watts or less and a minimum length of 1.5 inches for resistors of higher power ratings, or it shall be flatted to within 0.156 inch of the mounting bushing (or mounting surface if no bushing is present), whichever length is shorter. Thickness of the flatted portion shall be as specified (see 3.1).

3.4.3.3 Slotted shafts (when applicable)(see 3.1). The dimensions shall be as specified (see 3.1). In no case shall the slot be deep enough to interfere with shaft retainers. The slots shall so positioned that the centerline is within  $\pm 10^\circ$  of the centerline of the contact arm.

3.4.4 Stops. Stops employed to limit the mechanical rotation of the contact arm assembly may be part of, but shall not complete, any electrical circuit.

3.4.5 Terminals. Resistors shall be supplied with either soldering or screw terminals, as specified (see 3.1). Terminals shall permit secure electrical and mechanical connection of wire to carry adequately the maximum current of resistors (see 3.1). The terminal hole size shall be as specified (see 3.1). Soldering terminals shall be suitably coated to facilitate soldering.

3.4.5.1 Electrical off position (when applicable). The construction of the electrical off position shall be such that there will be no question as to when the contact is turned from the winding. There shall be no provision for a terminal at the off position. The number of terminals shall be as specified (see 3.1).

3.4.5.2 Solder dip (retinning) leads. The manufacturer may solder dip/retrain the leads of product supplied to this specification provided the solder dip process has been approved by the qualifying activity. The manufacturer shall maintain a solder purity in accordance with table V, during the tinning process.

TABLE V. Contamination limits.

Contamination	Tinning percent by weight 1/
Copper	0.750
Gold	0.500
Cadmium	0.010
Zinc	0.008
Aluminum	0.008
Antimony	0.500
Iron	0.020
Arsenic	0.030
Bismuth	0.250
Silver	0.750
Nickel	0.250

1/ This is a fixed percentage by weight of the solder.

3.4.5.2.1 Qualifying activity approval. Approval of the solder dip process will be based on one of the following options:

- a. When the original Lead finish qualified was hot solder dip lead finish S2 of MIL-STD-1276. (NOTE: The 200 microinch maximum thickness is not applicable.) The manufacturer shall use the same solder dip process for reflowing as is used in the original manufacture of the product.
- b. When the lead originally qualified was not hot solder dip finish S2 of MIL-STD-1276 as prescribed in a., approval for the process to be used for solder dip shall be based on the following test procedure:
  - (1) Thirty samples of any resistance value for each style and lead finish are subjected to the manufacturer's solder dip process. Following the solder dip process, the resistors are subjected to the dc resistance test (and other group A electricals). No defects are allowed.
  - (2) Ten of the 30 samples are then subjected to the solderability test. No defects are allowed.
  - (3) The remaining 20 samples are subjected to the resistance to soldering heat test followed by the moisture resistance test. No defects are allowed.

3.4.5.2.2 Solder dip reflowing options. The manufacturer may solder dip/reflow as follows:

- a. After group A tests. Following the solder dip/reflowing process, the electrical measurements required in group A, subgroup 1, tests shall be repeated on the lot. The group A, subgroup 1, lot rejection criteria shall be used. Following these tests, the manufacturer shall submit the lot to the group A solderability test as specified in 4.6.16.
- b. As a corrective action if the lot fails the group A solderability test.

3.4.6 Mounting. Mounting of resistors shall be as specified (see 3.1 and tables II and III).

3.4.6.1 Locking bushing. Locking bushings for applicable styles shall be as specified (see 3.1).

3.4.6.2 Nonturn device. A nonturn device shall be furnished on standard bushing and locking bushing type resistors which will prevent rotation of resistors with respect to the surface on which they are mounted. The location of the nonturn device and its widest dimension shall be as specified (see 3.1). If the nonturn device is not symmetrical about its vertical axis, it shall be so placed that a plane raised perpendicular to the widest dimension and through its center will pass through the axis of the operating shaft.

3.4.7 Mechanical rotation. The total mechanical rotation shall be as specified (see 3.1).

3.4.8 Enclosure. When specified (see 3.1), resistors shall have a suitable enclosure for protection against mechanical and electrical damage and shall be substantially dust proof.

3.4.9 Hardware. When specified (see 3.1), each resistor shall be furnished with a corrosion resistant, hexagonal mounting nut (see 3.12), corrosion resistant internal tooth lockwasher, and when applicable, locking nut and flatted machine screws, not assembled on the resistor unless otherwise specified (see 6.2). For direct Government orders, hardware shall be assembled on the resistor. Where applicable, the dimensions of the hardware shall be as specified (see 3.1).

→ 3.4.9.1 Threaded parts. All threaded parts shall be in accordance with FED-STD-H28, and as specified (see 3.1).

3.4.9.2 Locking of screw thread assemblies. All screw thread assemblies shall be rendered resistant to loosening under vibration.

3.5 Dielectric withstanding voltage. When resistors are tested as specified in 4.6.2, there shall be no evidence of flashover, mechanical damage, arcing, or insulation breakdown.

3.6 DC resistance.

3.6.1 Total resistance. When resistors are tested as specified in 4.6.3 to 4.6.3.1.2, as applicable, the total resistance value shall be within the specified resistance tolerance for the nominal total resistance value (see 1.2.1.5 and 3.1).

3.6.2 Minimum resistance. When resistors are tested as specified in 4.6.3 to 4.6.3.2, as applicable, the minimum resistance value shall not exceed 0.2 ohm, or 0.2 percent of the nominal resistance value (see 3.1), whichever is larger.

### 3.7 Torque.

3.7.1 Operating. When resistors are tested as specified in 4.6.4.1, the torque required to rotate the contact arm shall be as specified (see 3.1).

3.7.2 Stops. When resistors are tested as specified in 4.6.4.2, there shall be no damage to the contact arm, stop, and nonturn device, as applicable.

3.7.3 Locking (when applicable)(see 3.1). When resistors are tested as specified in 4.6.4.3, there shall be no damage to the bushings, threads, and nonturn device. The contact arm shall not move when subjected to the specified torque.

3.8 Low temperature exposure. When resistors are tested as specified in 4.6.5, the torque required to rotate the contact arm shall not exceed the value specified (see 3.1). There shall be no discontinuity, electrical connections shall not be affected, nor shall there be any loosening of rivets or evidence of other mechanical damage.

3.9 Power rating (when applicable)(see 3.1). When resistors are tested as specified in 4.6.6, the hotspot temperature shall not exceed the temperature specified (see 3.1).

3.10 Load life. When resistors are tested as specified in 4.6.7, the change in total resistance measurement and each of the succeeding total resistance measurements shall not exceed 5 percent, nor shall there be any evidence of mechanical damage.

3.11 Vibration, high frequency. When resistors are tested as specified in 4.6.8, there shall be no evidence of intermittent contacts or electrical discontinuity. The total resistance shall not change in excess of 5 percent. The contact arm shall not move more than 2°, nor shall there be a change in resistance between the contact arm terminal and either end terminal in excess of 5 percent. There shall be no evidence of mechanical damage.

3.12 Salt spray (corrosion). When resistors are tested as specified in 4.6.9, there shall be no marked corrosion. Resistors shall be mechanically operative and electrically continuous, and the mounting hardware (see 3.4.9) shall be readily removable.

3.13 Humidity (steady-state). When resistors are tested as specified in 4.6.10, the change in total resistance shall not exceed 10 percent between the initial total resistance measurement and each of the succeeding total resistance measurements.

3.14 Rotational Life. When resistors are tested as specified in 4.6.11, the change in total resistance shall not exceed 5 percent between total resistance measurement and the final total resistance measurement. During and after the tests, the resistors shall be mechanically operative, and there shall be no evidence of intermittent contact between the contact arm and resistance element, and mechanical damage.

3.15 Terminal strength (when applicable)(see 3.1). When resistors are tested as specified in 4.6.12, there shall be no evidence mechanical damage and the change in total resistance shall not exceed 1 percent.

3.16 Shock (when applicable)(see 3.1). When resistors are tested as specified in 4.6.13, there shall be no open circuit or intermittent contact; movement of the contact arm shall not result in a resistance change greater than 10 percent; the total resistance shall not change in excess of 2 percent; and there shall be no evidence of mechanical damage.

3.17 Acceleration (when applicable)(see 3.1). When resistors are tested as specified 4.6.14, there shall be no open circuit or intermittent contact; movement of the contact arm shall not result in a resistance change greater than 10 percent; the total resistance shall not change in excess of 3 percent; and there shall be no evidence of mechanical damage.

3.18 Vibration, high frequency (when applicable)(see 3.1). When resistors are tested as specified in 4.6.15, there shall be no open circuit or intermittent contact; movement of the contact arm shall not result in a resistance change greater than 10 percent; the total resistance shall not change greater in excess of 2 percent; and there shall be no evidence of mechanical damage.

3.19 Solderability. When tested as specified in 4.6.16, resistors shall meet the criteria for tab evaluation in the test method.

3.20 Fungus. All external materials shall be nonnutrient to fungus growth or shall be suitably treated to retard fungus growth. The manufacturer shall verify by certification that all external materials are fungus resistant or shall test resistors as specified in 4.6.17. There shall be no evidence of fungus growth on the external surfaces.

3.21 Marking. Resistors shall be marked in accordance with MIL-STD-1285, with the PIN, the manufacturer's name, registered trade mark or code symbol, the nominal total resistance, and the maximum current. The PIN shall be placed either on the rear or on the outer periphery of enclosed resistors. The other markings shall be placed in any other convenient location. There shall be no space between the symbols which comprise the PIN. If lack of space requires it, the PIN may appear on two lines. If this occurs, the PIN shall be divided between the document number and the dash number as shown in the following example:

RPO6  
2SB252KK

3.22 Workmanship. Resistors shall be processed in such a manner as to be uniform in quality and shall be free from defects that will affect life, serviceability, or appearance.

3.22.1 Soldering. When soldering is employed, only noncorrosive fluxes shall be used. Solder shall not be used for obtaining mechanical strength. Electrical connections shall be mechanically secure before and electrically continuous after soldering.

#### 4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or purchase order, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in this specification where such inspections are deemed necessary to ensure supplies and services conform to prescribed requirement.

4.1.1 Responsibility for compliance. All items shall meet all requirements of sections 3 and 5. The inspection set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of ensuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling inspection, as part of manufacturing operations, is an acceptable practice to ascertain conformance to requirements, however, this does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to accept defective material.

4.1.2 Test equipment and inspection facilities. Test and measuring equipment and inspection facilities of sufficient accuracy, quality and quantity to permit performance of the required inspection shall be established and maintained by the supplier. The establishment and maintenance of a calibration system to control the accuracy of the measuring equipment shall be in accordance with MIL-STD-45662.



## MIL-R-22C

TABLE VI. Qualification inspection for standard bushing type resistors.

Examination or test	Requirement paragraph	Method Paragraph	Number of failures allowed <sup>1/</sup>
<u>Group I (all sample units according to style) 2/</u> Visual and mechanical examination 2/	3.3 to 3.4.5 3.4.6 to 3.4.9.2 incl, 3.21 to 3.22.1 inclusive	4.6.1	1
Dielectric withstanding voltage	3.5	4.6.2 to 4.6.2.2 incl	
DC resistance	3.6	4.6.3 to 4.6.3.2 incl	
Torque	3.7	4.6.4	
Low temperature exposure	3.8	4.6.5	
<u>Group II (4 sample units according to style)</u> Power rating (when applicable)(see 3.1) Load life Vibration (when applicable)(see 3.1) Salt spray (corrosion)	3.9 3.10 3.11 3.12	4.6.6 4.6.7 4.6.8 4.6.9	1
<u>Group III (4 sample units according to style)</u> Humidity (steady state)	3.13	4.6.10	
<u>Group IV (4 sample units according to style)</u> Life (rotational) Terminal strength (when applicable) (see 3.1) Shock (when applicable)(see 3.1) 4/	3.14 3.15 3.16	4.6.11 4.6.12 4.6.13	
<u>Group V (4 sample units according to style)</u> Acceleration (when applicable)(see 3.1) Shock (when applicable)(see 3.1) Vibration, high frequency (when applicable)(see 3.1)	3.17 3.16 3.18	4.6.14 4.6.13 4.6.15	
<u>Group VI (4 sample units according to style)</u> Solderability	3.19	4.6.16	
<u>Group VII (4 sample units)</u> Fungus	3.20	4.6.17	0

1/ Failure of a resistor in one or more tests of a group shall be charged as a single defective.

2/ Nondestructive examination and tests.

3/ Marking shall be considered defective only if marking is illegible.

4/ Not applicable to styles RPO5, RPO6, and RPO7 (see 3.1).

5/ Applicable only to styles RPO5, RPO6, and RPO7 (see 3.1).



TABLE VII. Qualification inspection for locking bushing type resistors. 1/

Examination or test	Requirement paragraph	Method paragraph	Number of failure allowed 2/
Group I (all sample units according to style) 3/ Visual and mechanical examination 4/	3.1 to 3.4.5, 3.4.6 to 3.4.9.2 inclusive, and 3.21 to 3.22.1 inclusive.	4.6.1	0
Dielectric withstanding voltage	3.5	4.6.2 to 4.6.2.2	
DC resistance	3.6	4.6.3 to 4.6.3.2	
Torque	3.7	4.6.4	
Low temperature exposure	3.8	4.6.5	1
Group II			
Life (rotational)	3.14	4.6.11	
Terminal strength (when applicable)(see 3.1)	3.15	4.6.12	
Shock (when applicable)(see 3.1) 4/	3.16	4.6.13	

1/ This inspection is applicable only to four additional locking bushing type resistors when submitted with the same style of standard bushing type resistors.

2/ Failure of an individual resistor in one or more tests of a group shall be charged as a single defective.

3/ Nondestructive examinations or tests.

4/ Marking will be considered defective only if marking is illegible.

4.2 Classification of inspections. Inspection requirements specified herein are classified as follows:

- a. Qualification inspection (see 4.4).
- b. Quality conformance inspection (see 4.5).

4.3 Inspection conditions. Unless otherwise specified herein, all inspections shall be performed in accordance with the test conditions specified in the "GENERAL REQUIREMENTS" of MIL-STD-202.

4.3.1 Precautions. Adequate precautions shall be taken to prevent condensation of moisture on resistors.

4.4 Qualification inspection. Qualification inspection shall be performed at a laboratory acceptable to the Government (see 6.3) on sample units produced with equipment and procedures normally used in production.

4.4.1 Sample size. The number of resistors to be subjected to qualification inspection shall be as specified in the appendix to this specification.

4.4.2 Test routine. Sample units shall be subjected to the qualification inspection specified in table VI or VII, as applicable, in the order shown. All sample units in table VI shall be subjected to the inspection of group I. The sample units shall then be divided as specified in table VI for groups II to VII, inclusive, as applicable, and subjected to the inspection for their particular group, and as follows: For group II, three sample units of the highest nominal total resistance value and one sample unit of the applicable lower nominal total resistance value (see table XIV); for group III, three sample units of the highest nominal total resistance value and one sample unit of the applicable lower nominal total resistance value (see table XIV); for group IV, two sample units of the highest nominal total resistance value and two sample units of the applicable lower nominal total resistance value (see table XIV); for group V, as applicable, four sample units of the highest nominal total resistance; and four samples of any resistance value; for group VI, four samples of any resistance value according to style; for group VII, four samples of any resistance value. For locking bushing type resistors submitted with standard bushing resistors, the four additional sample units will be subjected to the examinations and tests of group I and II of table VII.

4.4.3 Defectives. Defectives in excess of those allowed in table VI or VII, as applicable, will be cause for refusal to grant qualification.

4.4.4 Retention of qualification. To retain qualification, the supplier shall forward a report at 6-month intervals to the qualifying activity. The qualifying activity shall establish the initial reporting date. The report shall consist of:

- a. A summary of the results of the tests performed for inspection of product for delivery (groups A and B), indicating as a minimum the number of lots that have passed and the number that have failed. The results of the tests of all reworked lots shall be identified and accounted for.
- b. A summary of the results of tests performed for qualification verification inspection (group C), indicating as a minimum the subgroup failures. The summary shall include results of all qualification verification inspection test performed on completed lots during the 6-month period. If summary of the test results indicates nonconformance with specification requirements, and corrective action acceptable to the qualifying activity has not been taken, action will be taken to remove the failing product from the qualified products list.

Failure to submit the report within 30 days after the end of each 6-month period may result in loss of qualification for the product. In addition to the periodic submission of inspection data, the supplier shall immediately notify the qualifying activity at any time during the 6-month period that the inspection data indicates failure of the qualified product to meet the requirements of this specification.

In the event that no production occurred during the reporting period, a report shall be submitted certifying that the company still has the capabilities and facilities necessary to produce the item. If during two consecutive reporting periods there has been no production, the manufacturer may be required, at the discretion of the qualifying activity, to submit a representative product of each style and characteristic to testing in accordance with the qualification requirements.

#### 4.5 Quality conformance.

4.5.1 Inspection of packaging. Inspection of packaging shall consist of groups A and B.

4.5.1.1 Inspection lot. An inspection lot, as far as practicable, shall consist of all resistors of the same style produced in a period not to exceed 30 days, produced under essentially the same conditions, and offered for inspection at one time.

4.5.1.2 Group A inspection. Group A inspection shall consist of the examination and tests specified in table VIII, and shall be made on the same set of sample units, in the order shown.

TABLE VIII. Group A inspection.

Examination or test	Requirement paragraph	Method paragraph	Sampling plan
<u>Subgroup 1</u> DC resistance	3.6	4.6.3	4.5.1.2.1.1
<u>Subgroup 2</u> Visual and mechanical examination			
Material	3.3	4.6.1	4.5.1.2.1.2
Overall body and mounting dimensions	3.4		
Other physical dimensions	3.4		
Shaft dimensions	3.4.3 to 3.4.3.3		
Mechanical rotation	3.4.7		
Marking	3.21		
Workmanship	3.22 to 3.22.1 3.22.1		

1/ Marking defects shall be charged only for illegible, incomplete, or incorrect marking. Incorrect marking defects shall be charged only to examination for style and type of marking. Incorrect electrical off position, resistance, and resistance tolerance markings shall be determined by and shall be charged to the dc resistance test (see 4.6.3 to 4.6.3.2, inclusive).

TABLE IX. Group A sampling plan.

Lot size	Subgroup 1 sampling plan	Subgroup 2 sampling plan
1 to 8	100 percent	100 percent
9 to 90	100 percent	13
91 to 150	125	13
151 to 280	192	20
281 to 500	192	29
501 to 1,200	192	34
1,201 to 3,200	192	42
3,201 to 10,000	192	50
10,001 to 35,000	294	60
35,001 to 150,000	294	74
150,001 to 500,000	345	90
500,001 and over	435	102

4.5.1.2.1 Sampling plan.

4.5.1.2.1.1 Subgroup 1. A sample of parts from each inspection lot shall be randomly selected in accordance with table IX. If one or more defects are found, the lot shall be screened and defectives removed. After screening and removal of defectives a new sample of parts shall be randomly selected in accordance with table IX. If one or more defects are found in this second sample, the lot shall be rejected and shall not be supplied to this specification. Resistance values in the samples shall be representative, and where possible, in proportion to the resistors in the inspection lot.

4.5.1.2.1.2 Subgroup 2. A sample of parts from each inspection lot shall be randomly selected in accordance with table IX. If one or more defects are found, the lot shall be screened and defectives removed. After screening and removal of defectives, a new sample of parts shall be randomly selected in accordance with table IX. If one or more defects are found in the second sample, the lot shall be rejected and shall not be supplied to this specification.

4.5.1.2.1.3 Disposition of samples. The solderability test is considered a destructive test and samples submitted to the solderability test shall not be supplied on the contract.

4.5.1.3 Group B inspection. Group B inspection shall consist of the tests specified in table X, in the order shown, and the sample shall be selected from inspection lots that have passed group A inspection.

4.5.1.3.1 Subgroup 1. A sample of parts shall be randomly selected in accordance with table XI. If one or more defects are found, the lot shall be screened and defectives removed. After screening and removal of defectives, a new sample of parts shall be randomly selected in accordance with table XI. If one or more defects are found in the second sample, the lot shall not be supplied to this specification.

TABLE X. Group B inspection.

Examination or test	Requirement paragraph	Method paragraph
<u>Subgroup 1</u>		
Dielectric withstanding voltage	3.5	4.6.2.1
torque	3.7	4.6.4
<u>Subgroup 2</u>		
Solderability	3.19	4.6.16

TABLE XI. Group B sampling plan.

Lot size	Subgroup 1 sampling plan	Subgroup 2 sampling plan
1 to 25	3	5
26 to 50	5	5
51 to 90	6	5
91 to 150	7	5
151 to 280	10	5
281 to 500	11	5
501 to 1,200	15	5
1,201 to 3,200	18	5
3,201 to 10,000	22	8
10,001 to 35,000	29	13
35,001 and over	29	20

4.5.1.3.2 Subgroup 2. A sample of parts shall be randomly selected in accordance with table XI, and subjected to the subgroup 2 solderability test. If there are one or more defects, the lot shall be considered to have failed.

4.5.1.3.2.1 Rejected lots. In the event of one or more defects, the inspection lot is rejected. The manufacturer may use one of the following options to rework the lot:

- a. Each production lot that was used to form the failed inspection lot shall be individually submitted to the solderability test as required in 4.6.16. Five samples shall be selected from each production lot that formed the failed inspection lot. Production lots that pass the solderability test are available for shipment. Production lots failing the solderability test can be reworked only if submitted to the solder dip procedure in b.
- b. The manufacturer submits the failed lot to a 100 percent solder dip using an approved solder dip process in accordance with 3.4.5.2. Following the solder dip the electrical measurements required in group A subgroup 1 test shall be repeated on 100 percent of the lot. Five additional samples shall then be selected and subjected to the solderability test with zero defects allowed. If the lot fails this solderability test, the lot shall be considered rejected and shall not be furnished against the requirements of this specification.

4.5.1.3.2 Disposition of sample units. Sample units which have passed all the group B inspection may delivered on the contract or purchase order, if the lot is accepted.

4.5.1.4 Group C inspection. Group C inspection shall consist of the tests specified in table XII, in the order as shown.

4.5.1.4.1 Sampling plan. Every 3 months, the sample shall be selected from that style in each group specified in table XIII, currently in production, and having the greatest production during the 3-month period. The sample shall consist of 12 or 16 sample units, as practicable, of the highest nominal total resistance value produced in that style during that period. Sample units shall be selected from lots that have passed groups A and B inspection.

4.5.1.4.2 Test routine. The sample units shall be divided as specified in table XII for subgroups 1 to 4, inclusive, as applicable, and subjected to the inspection for their particular subgroup.

4.5.1.4.3 Defectives. One defect shall be allowed for subgroups 1, 2, and 3, combined, and one defect shall be allowed for subgroups 1, 2, 3, and 4, combined, as applicable. If more than one sample unit is defective in any of the combined subgroups, it shall be considered that the sample failed. Failure of a resistor in one or more tests of a subgroup shall be charged as a single defective.

4.5.1.4.4 Disposition of sample units. Sample units subjected to group C inspection shall not be delivered on the contract or purchase order.

4.5.1.4.5 **Noncompliance.** If a sample fails to pass group C inspection, the supplier shall take corrective action on the materials or processes, or both, as warranted, and on all sample units of product which can be corrected and which were manufactured under essentially the same conditions, with essentially the same materials, processes, etc., and which are considered subject to failure. Acceptance of product shall be discontinued until corrective action, acceptable to the Government, has been taken. After corrective action has been taken, group C inspection shall be repeated on additional sample units (all inspection, or the inspection which the original sample failed, at the option of the Government). Groups A and B inspection may be reinstituted; however, final acceptance shall be withheld until corrective action was successful. In the event of failure after reinspection, information concerning the failure and corrective action taken shall be furnished to the contracting officer.

TABLE XII. Group C inspection.

Test	Requirement paragraph	Method paragraph	Number of sample units to be inspected
<u>Subgroup 1</u> Humidity (steady-state)	3.13	4.6.10	4
<u>Subgroup 2</u> Low temperature exposure Life (rotational) Terminal strength (when applicable)(see 3.1) Shock (when applicable) (see 3.1)	3.8 3.14 3.15 3.16	4.6.5 4.6.11 4.6.12 4.6.13	4
<u>Subgroup 3</u> Power rating (when applicable) (see 3.1) Load life Vibration (when applicable) (see 3.1) 1/ Salt spray (corrosion)	3.9 3.10 3.11 3.12	4.6.6 4.6.7 4.6.8 4.6.9	4
<u>Subgroup 4</u> 2/ Acceleration (when applicable) (see 3.1) Shock, (when applicable) (see 3.1) Vibration, high frequency (when applicable)(see 3.1)	3.17 3.16 3.18	4.6.14 4.6.13 4.6.15	4

1/ Not applicable to styles RP05, RP06, and RP07 (see 3.1).

2/ Applicable only to styles RP05, RP06, and RP07 (see 3.1).

TABLE XIII. Style grouping for group C inspection (see 3.1).

Style grouping				
RP05	RP07 RP05	RP10 RP15 RP20 RP25 RP30	RP11 RP16	RP35 RP40 RP45 RP50 RP55

4.5.2 **Inspection of packaging.** The sampling and inspection of the preservation, packaging, packing, and container marking shall be in accordance with the requirements of MIL-R-39032.

#### 4.6 Methods of examination and test.

4.6.1 Visual and mechanical examination. Resistors shall be examined to verify that the materials, design, construction, physical dimensions, marking, and workmanship are in accordance with the applicable requirements (see 3.1, 3.3 to 3.4.5, 3.4.6 to 3.4.9.2, and 3.21 to 3.22.1, inclusive).

#### 4.6.2 Dielectric withstanding voltage (see 3.5).

4.6.2.1 Atmospheric pressure. Resistors shall be tested in accordance with method 301 of MIL-STD-202. The following details shall apply:

- a. Magnitude of test voltage: 1,000 root-mean-square (rms) for all resistor styles except RPO5, RPO6, and RPO7 (see 3.1), which shall be 500 volts rms.
- b. Nature of potential: An alternating current (ac) supply at commercial line frequency and waveform.
- c. Points of application of test voltage: Between the resistor terminals tied together and the bushing or shaft, as applicable. For product acceptance inspection, the duration of application of the voltage may be shortened to 1 second.
- d. Examinations after test: Resistors shall be examined for evidence of flashover, mechanical damage, arcing, and insulation breakdown.

4.6.2.2 Barometric pressure. Resistors shall be tested in accordance with method 105 of MIL-STD-202. The following details and exceptions shall apply:

- a. Test condition 8.
- b. Test voltage during subjection to reduced pressure: 550 volts rms for all resistor styles except RPO5, RPO6, and RPO7 (see 3.1), which shall be 250 volts rms.
- c. Nature of potential: As specified in 4.6.2.1b.
- d. Points of application: As specified in 4.6.2.1c.
- f. Examinations and measurements: As specified in 4.6.2.1d.

4.6.3 DC resistance (see 3.6). Resistors shall be tested in accordance with method 303 of MIL-STD-202. Measuring instruments used for initial and final readings of this test, can be of different styles or models provided performance is equivalent. All test equipment shall be calibrated in accordance with MIL-STD-45662.

4.6.3.1 Total resistance (see 3.6.1). The contact arm shall be rotated 25 cycles to remove any foreign material which may have accumulated on the resistance element. The total resistance shall be measured.

4.6.3.1.1 Total resistance of a resistor with an electrical off position (see 3.6.2). The total resistance of a resistor with an electrical off position shall be the resistance between its terminals when the movable contact is located at the position introducing the total resistance element of the resistor.

4.6.3.1.2 Total resistance of a resistor without an electrical off position. The total resistance of a resistor without an electrical off position shall be the resistance between the end terminals when the movable contact is at the extreme counterclockwise end of the total resistance.

4.6.3.2 Minimum resistance (see 3.6.2). The contact arm shall be rotated to its extreme counterclockwise limit of rotation. With the arm in this position, the resistance between the counterclockwise terminal and rotating contact terminal shall be measured. The contact arm shall then be rotated to its extreme clockwise limit of rotation. With the arm in this position, the resistance between the clockwise terminal and the rotating contact terminal shall be measured. If one terminal is an electrical off position, this test shall not apply to that position.

#### 4.6.4 Torque (see 3.7).

4.6.4.1 Operating. The torque required to rotate the contact arm on the resistance element shall be determined throughout the entire range of mechanical rotation by the torque wrench method or by any other method satisfactory to the Government.

4.6.4.2 Stop. The contact arm shall be rotated to each extreme limit of rotation, and the specified torque (see 3.1) shall be applied to the operating shaft. Resistors shall then be examined for damage to the contact arm, stop, and nonturn device, as applicable.

4.6.4.3 Locking (when applicable)(see 3.1). Resistors shall be mounted on a metal panel by their normal mounting means and the locking device tightened with a torque wrench not greater than 8 inch-pounds. With the locking nut tightened, a 20 ounce-inches torque shall be applied to the operating shaft. Movement of the shaft shall be checked visually, and resistors shall be examined for damage to the bushing, threads, and nonturn device.

4.6.5 Low temperature exposure (see 3.8). Resistors shall be mounted on a panel in a refrigeration chamber. Low heat conducting extension shafts shall be placed through holes in the chamber such that rotation of the contact arm may be affected from outside the chamber. The chamber shall then be cooled to  $-55^{\circ}\text{C} \pm 0^{\circ}\text{C}$ ,  $-3^{\circ}\text{C}$  and held at this temperature for 1 hour. At the expiration of the hour, the amount of torque required to rotate the contact arm shall be determined by the method specified in 4.6.4.1. Continuity, electrical connections, loosening of rivets, and effect of lubricants shall be checked. Resistors shall be examined for electrical and mechanical damage.

4.6.6 Power rating (when applicable)(see 3.1).

4.6.6.1 Mounting. Resistors shall be centrally mounted with terminals pointing downward on a vertical steel panel of the dimensions specified in still air at an ambient temperature of  $25^{\circ}\text{C} \pm 5^{\circ}\text{C}$  (see 3.1). No shielding shall be closer than 12 inches to the panel. Still air is surrounding air with no circulation other than that created by the heat of the resistor being operated.

4.6.6.2 Procedure. Rated power shall be applied with the contact arm in the position introducing total resistance. The hot spot shall be determined by the use of a thermocouple with 0.010030 inch diameter (No. 30 AWG) or smaller wire, after thermal stability has been reached. After determination of the hot spot, the thermocouple shall be cemented immediately adjacent to the exposed portion of the winding, using a minimum quantity of cement, and the hotspot temperature rise shall be measured. For the purpose of this test, thermal stability will have been reached when no further change in temperature is observed between two successive measurements taken at 5 minute intervals. The hotspot is the point or elemental area of maximum temperature on the exposed surface of the winding.

4.6.7 Load life (see 3.10). Load life shall be conducted at any ambient temperature from  $20^{\circ}\text{C}$  to  $40^{\circ}\text{C}$ . The total resistance shall be measured as specified in 4.6.3 to 4.6.3.1.2, as applicable. With the resistors mounted as specified in 4.6.6.1 and with the movable contact adjusted for total resistance, the applicable rated wattage, in accordance with figure 1, shall be applied intermittently, 1.5 hours on and 0.5 hour off, for a total of 1,000 hours. Circuit connections shall be such that current flows through the movable contact. Total resistance measurements (see 4.6.3 to 4.6.3.1.2, as applicable) shall be made at the end of the 0.5 hour off periods after  $50 \pm 8$ ,  $100 \pm 8$ ,  $250 \pm 8$ ,  $500 \pm 12$ ,  $750 \pm 12$ , and  $1,000 \pm 12$  hours have elapsed. Before the final resistance measurement is made, the contact arm shall be rotated 25 cycles. Resistors shall be examined for evidence of mechanical damage.

4.6.8 Vibration (when applicable)(see 3.1)(see 3.11). Resistors shall be tested in accordance with method 201 of MIL-STD-202. The following details shall apply:

- a. Method of mounting: With the contact arm set at approximately 50 percent of the effective rotation.
- . Locking bushing type resistors shall have the locking nut tightened with a torque not greater than 8 inch-pounds.
- b. Measurement after vibration: Total resistance shall be measured as specified in 4.6.3 to 4.6.3.1.2, as applicable. The position of the contact arm shall be measured in degrees and the resistance between the contact arm terminal and either end terminal.
- c. Measurement during vibration: Each resistor shall be monitored to determine electrical discontinuity or movement of contact area.
- d. Measurement after vibration: As specified in 4.6.8b. Resistors shall be examined for mechanical damage.

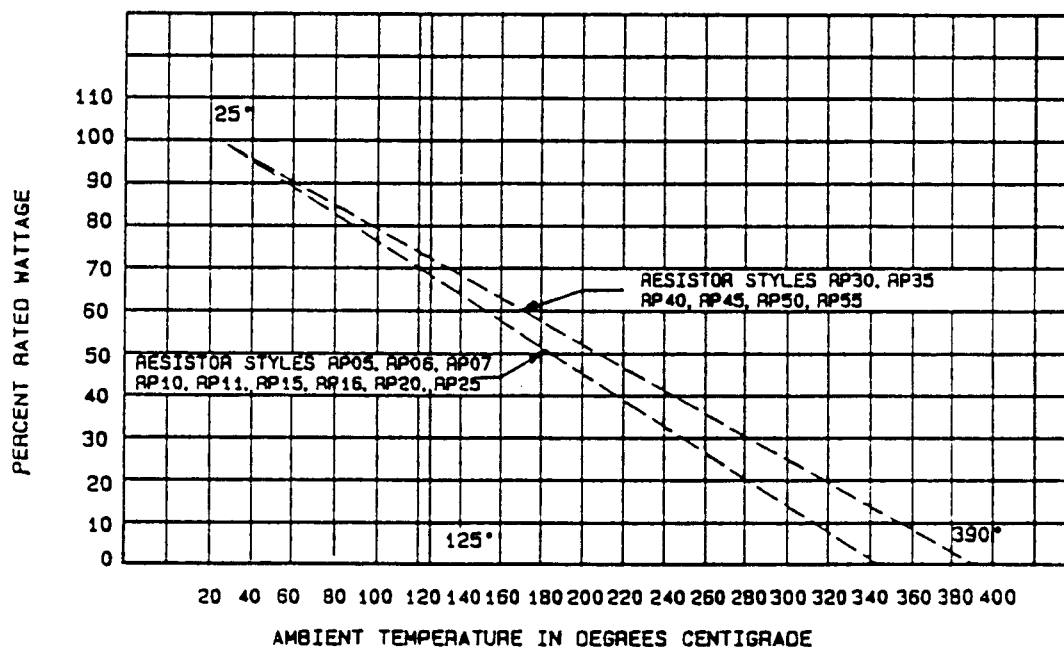


4.6.9 Salt spray (corrosion)(see 3.12). Resistors shall be tested in accordance with method 101 of MIL-STD-202. The following details and exceptions shall apply:

- a. Mounting detail: On aluminum panels by their normal mounting means.
- b. Test condition letter B.
- c. Examination and test after exposure: Enclosures, if any, shall be removed and resistors washed, shaken, and air blasted and permitted to dry for 24 hours at 40°C. The resistors shall then be examined for marked corrosion, and tested for electrical continuity and mechanical operation. Hardware shall be removed at the end of the test.

4.6.10 Humidity (steady-state) (see 3.1)(see 3.13). Resistors shall be tested in accordance with method 103 of MIL-STD-202. The following details and exceptions shall apply:

- a. Mounting: On an aluminum panel.
- b. Measurement after conditioning: Total resistance (see 4.6.3 to 4.6.3.1.2, as applicable) shall be measured.
- c. Test condition letter B.
- d. Length of time and points of application of polarizing voltage: A 120 volt dc potential shall be applied for 96 hours between the mounting panel and the resistor winding through the contact arm set at extreme counterclockwise end of the total resistance. The positive terminal of the voltage source shall be applied to the resistor winding.



NOTE:  
OPERATION OF THESE RESISTORS AT AMBIENT TEMPERATURES  
GREATER THAN 125°C CAN DAMAGE THE METAL PLATING  
SHAFT LUBRICANT, ETC. OF THE RESISTOR.

FIGURE 1. Power rating curves for continuous duty (see 3.1).

- e. Measurement during test: Total resistance (see 4.6.3 to 4.6.3.1.2, as applicable) shall be measured at the end of the 96 hour period.
- f. Measurement after test: Total resistance (see 4.6.3 to 4.6.3.1.2, as applicable) shall be measured after the resistors have been removed from the humidity chamber and placed in a dry atmosphere at  $40^{\circ}\text{C} \pm 5^{\circ}\text{C}$  for 1 hour 15 minutes.

4.6.11 Life (rotational)(see 3.14). Resistors shall be tested in accordance with method 206 of MIL-STD-202. The following details and exceptions shall apply:

- a. Mounting: Resistors shall be ganged in pairs and connected as shown on figures 2 or 3, as applicable, such that a substantially constant current of nominal rating (see 3.1) flows through the resistors irrespective of the contact arm position during oscillation of the contact arm. Resistors shall be mounted with the shafts extending in a horizontal plane and with the terminals pointing downward. The shafts of resistors without an electrical off position shall be connected mechanically so that they turn simultaneously in the direction when viewed from the mounting surface. The shafts of resistors with an electrical off position shall be connected mechanically so that they turn simultaneously in opposite directions when view from the mounting surface. Locking bushing type resistors shall have their locking nuts removed.
- b. Test potential: A direct current potential equivalent to that required to dissipate rated wattage across the entire resistive element of resistors having the same nominal total resistance as those under test shall be applied as shown on figures 2 and 3, as applicable. If desired, an ac potential may be applied to resistors not having an electrical off position.
- c. Cycle rate in cpm: 20 cpm through 90 percent of total mechanical rotation. For resistors having an electrical off position, the moving contact shall also pass through the electrical off position.
- d. Test condition letter:
  - (1) A, for locking bushing type resistors.
  - (2) C, for standard bushing type and two hole mounting resistors.
- e. Measurements prior to rotations: Total resistance as specified in 4.6.3 to 4.6.3.1.2, as applicable.
- f. Measurement during rotation: Resistors shall be monitored for evidence of intermittent contact between the contact arm and resistance element.
- g. Measurement and examination after rotations: Total resistance as specified in 4.6.3 to 4.6.3.1.2, as applicable, and examined for evidence of mechanical damage.

4.6.12 Terminal strength (when applicable)(see 3.1)(see 3.15). Total resistance shall be measured as specified in 4.6.3 to 4.6.3.1.2, as applicable. A 20 pound tensile load, in a direction normal to the mounting plane of the resistor, shall be applied in turn to each terminal for 1 minute. The total resistance shall then be measured as specified in 4.6.3 to 4.6.3.1.2, as applicable. Resistors shall be examined for evidence of mechanical damage.

4.6.13 Shock (when applicable)(see 3.16)(see 3.1). Resistors shall be tested in accordance with method 202 of MIL-STD-202.

- a. Mounting method and accessories: Resistors shall be mounted by their normal mounting means on an appropriate fixture. The mounting fixture shall be constructed in such a manner as to insure that the points of the resistor mounting supports will remain in a static condition with reference to the shock table. Test leads used during this test shall no larger than AWG 22 stranded wire, so that the influence of the test lead on the resistor will be held to a minimum. The test lead length shall be no longer than necessary. In all cases, the resistors shall be mounted in relation to the equipment in such a manner that the stress applied is in the direction which would be considered most detrimental. Locking bushing type resistors shall have the locking nut tightened with a torque not greater than 8 inch-pounds.
- b. Measurements before shock: Total resistance as specified in 4.6.3 to 4.6.3.1.2, as applicable, and the resistance between the contact arm terminal and one end terminal, with the contact arm positioned at the approximate midpoint of the resistance element.
- c. Acceleration: 50 gravity units (g's).

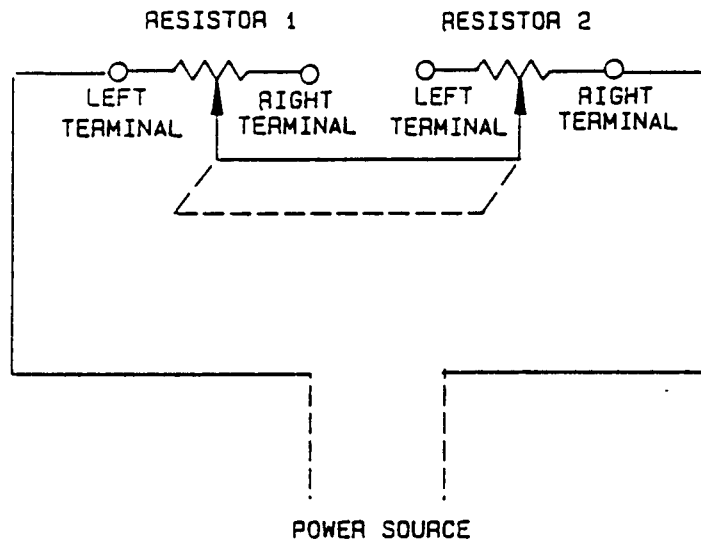


FIGURE 2. Rotational life test circuit for resistors without electrical off position.

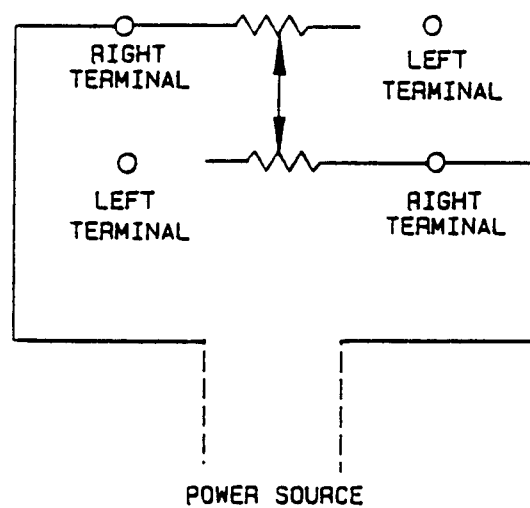


FIGURE 3. Rotational life test circuit for resistor with an electrical off position.

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- d. Number and direction of blows: Resistors shall be subjected to a total of 30 blows, as follows: Ten blows applied with the resistors in a horizontal plane and with shafts extended upward; 10 blows after the fixture has been rotated 180° so that shafts extend downward; and 10 blows after the fixture is rotated 90° so that the resistors are in a vertical plane with the removable contact arm in a horizontal position.
- e. Measurement during shock: Each resistor shall be monitored to determine electrical discontinuity. A measurement of transient resistance change between the contact arm terminal and left terminal shall also be made.
- f. Measurement and examination after shock: Total resistance as specified in 4.6.3 to 4.6.3.1.2, as applicable; resistance shall also be measured between the contact arm terminal and the same end terminal. Resistors shall then be examined for evidence of mechanical damage.

4.6.14 Acceleration (when applicable)(see 3.1 and 3.17).

4.6.14.1 Mounting of resistors. As specified in 4.6.13a.

4.6.14.2 Procedure. Total resistance shall be measured as specified in 4.6.3 to 4.6.3.1.2, as applicable, and resistance shall also be measured between the contact arm terminal and one end terminal. The resistors shall be subjected to a constant acceleration of 50 g's for a period of 5 seconds in each of the positions specified in 4.6.13d.

4.6.14.3 Measurements during acceleration. As specified in 4.6.13e.

4.6.14.4 Measurements and examination after acceleration test. As specified in 4.6.13f.

4.6.15 Vibration, high frequency (when applicable)(see 3.1 and 3.18). Resistors shall be tested in accordance with method 204 of MIL-STD-202. The following details and exceptions shall apply:

- a. Mounting of resistors: As specified in 4.6.13a.
- b. Measurements prior to vibration: As specified in 4.6.13b.
- c. Test condition letter B.
- d. Measurement during vibration: As specified in 4.6.13e.
- e. Direction of motion: As specified in 4.6.13d.
- f. Measurements and examination after vibration: As specified in 4.6.13f.

4.6.16 Solderability (see 3.19). Resistors shall be tested in accordance with method 208 of MIL-STD-202. The following details shall apply:

- a. All three terminals shall be tested.
- b. No special preparation of leads is required.
- c. Steam aging shall apply.
- d. Terminals shall be dipped within 0.125 inch of body. All three terminals shall be dipped simultaneously whenever possible, when configuration is such that terminals cannot be dipped simultaneously, the 0.125 inch shall apply to the terminal on whichever it occurs first when all three terminals are dipped in an orientation which most nearly meets the above requirement.
- e. Evaluation for tab terminals shall apply.

4.6.17 Fungus (see 3.20). Resistors shall be tested in accordance with method 508 of MIL-STD-810. Resistors shall be examined for evidence of mechanical damage.

5. PACKAGING

5.1 Packaging requirements. The requirements for packaging shall be in accordance with MIL-R-39032.

## 6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Intended use. Resistors covered by this specification are particularly adaptable to such applications as motor speed control, generator field control, lamp dimming, heater and oven control, potentiometer uses, and applications where variation of voltage or current is required, such as voltage divider and bleeder circuits.

6.2 Acquisition documents. Acquisition documents should specify the following:

- a. Title, number, and date of this specification.
- b. Title, number, and date of the applicable detail specification, and complete PIN (see 1.2.1 and 3.1).
- c. Hardware, whether assembled on resistor (see 3.4.9).
- d. Issue of DODISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.1).

6.3 Qualification. With respect to products requiring qualification, awards will be made only for products which are, at the time of award of contract, qualified for inclusion in Qualified Products List GPL No. 22-65 whether or not such products have actually been so listed by that date. The attention of the contractors is called to these requirements, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or purchase orders for the products covered by this specification. The activity responsible for the Qualified Products List is the Naval Electronics Systems Command and information pertaining to qualification of products may be obtained from the Defense Electronics Supply Center (DESC-E), 1507 Wilmington Pike, Dayton, OH 45444.

6.4 Subject term (key word) listing.

Potentiometer.

6.5 Derating. It is the intention of this specification to cover resistors capable of full load operation at an ambient temperature of 25°C. However, if it is desired to operate these resistors at an ambient temperature greater than 25°C, the resistors should be derated in accordance with figure 1.

6.6 Supplementary insulation. Resistors should not be used at potentials above ground greater than 500 volts (250 volts for resistors styles RP05, RP06, and RP07) (see 3.1), unless supplementary insulation is used.

6.7 Dissimilar metals. Unless suitably protected, metals such as brass, copper, or steel should not be used in intimate contact with aluminum or aluminum alloys.

6.8 Electrical off position. Care should be exercised in specifying an electrical off position when resistors are required to break dc circuit having potentials in excess of 40 volts.

6.9 Interchangeability. Resistors in this specification are mutually interchangeable with resistors of the same type designation acquired under MIL-R-22A.

6.10 Retinning leads. If retinning (hot solder dip) of the leads is required (see 3.4.5.2).

6.11 PIN. PIN is a new term encompassing terms previously used in specifications such as part number, type designator, identification number etc. (see 1.2.1).

6.12 Changes from the previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

## PROCEDURE FOR QUALIFICATION INSPECTION

## 10. SCOPE

10.1 Scope. This appendix details the procedure for submission of samples, with related data, for qualification inspection of resistors covered by this specification. The procedure for extending qualification of required sample to other resistors covered by this specification is also outlined herein. This appendix is a mandatory part of the specification. The information contained herein is intended for compliance.

20. APPLICABLE DOCUMENTS. This section is not applicable to this document.

## 30. SUBMISSION

30.1 Sample. All sample units shall be submitted with shafts 2.5 inches long except for locking bushing type resistors which shall be submitted with their longest shaft length (see table III).

30.1.1 Qualification sample when qualification is sought for resistors with and without an electrical off position. For qualification of standard bushing, or two hole mounting types, eight sample units without an electrical off position and with the highest nominal total resistance value for which qualification is sought, and four sample units in the same style with electrical off position symbol 2 (see 1.2.1.2) and with the applicable nominal total resistance value specified in table XIV shall be submitted. When resistor styles RPO5, RPO6 and RPO7 (see 3.1) are submitted, four additional sample units without an electrical off position with the highest nominal total resistance value for which qualification is sought shall also be submitted. To receive qualification of the locking bushing type resistors when standard bushing type resistors are being submitted, four additional sample units of locking bushing type resistors in the same style and without electrical off position shall be submitted. These sample units shall consist of two with the highest nominal total resistance value for which qualification is sought and two with the applicable nominal total resistance value specified in table XIV. One additional sample unit of each style shall be submitted to permit substitution for the permissible defective in group I of table VI or VII, as applicable.

30.1.2 Qualification sample when qualification is sought for resistors without an electrical off position. For qualification of standard bushing, locking bushing, or two hole mounting types, eight sample units without an electrical off position with the highest nominal total resistance value for which qualification is sought, and four sample units in the same style without an electrical off position with the applicable nominal total resistance value specified in table XIV shall be submitted. When resistor styles RPO5, RPO6 and RPO7 (see 3.1) are submitted, four additional sample units without an electrical off position with the highest nominal total resistance value for which qualification is sought shall also be submitted. To receive qualification of locking bushing type resistors when standard bushing are being submitted, four additional sample units of locking bushing type resistors in the same style and without an electrical off position shall be submitted. These sample units shall consist of two with the highest nominal total resistance value for which qualification is sought and two with the applicable nominal total resistance value specified in table XIV. One additional sample units of each style shall be submitted to permit substitution for permissible defective in group I of table VI or VII, as applicable.

30.2 Test data. When examinations and tests are to be performed at a government laboratory, prior to submission, all sample units shall be subjected to all examinations and tests indicated as nondestructive in table VI or VII, as applicable. Each submission shall be accompanied by the test data obtained from these examinations and tests. The performance of the destructive tests by the supplier on a duplicate set of sample units is encouraged, although not required. All tests data shall be submitted in duplicate.

30.3 Description of items. The supplier shall submit a detailed description of the resistors being submitted for inspection, including materials used for the resistance element and the enclosure, when applicable, or coating.

## APPENDIX

TABLE XIV. Nominal total resistance values to be submitted.

Style	Nominal total resistance value to be submitted
	<u>Ohms</u>
RP05	75
RP06	75
RP07	75
RP10	75
RP11	75
RP15	35
RP16	35
RP20	25
RP25	15
RP30	10
RP35	7.5
RP40	5.0
RP45	3.0
RP50	2.0
RP55	2.0

## 40. EXTENT OF QUALIFICATION

40.1 Extent of qualification. Qualification of the style submitted will extend qualification to the resistance range, which consist of the minimum nominal total resistance value specified (see 3.1) through the highest nominal total resistance value submitted. Qualification will also extend to all shaft designs covered by this specification. Qualification of electrical off position symbol 2 will also qualify electrical off position symbol 3.

## CONCLUDING MATERIAL

## Custodians:

Army - ER  
Navy - EC  
Air Force - 85

## Review activities:

Army - AR, MI  
Navy - AS, OS  
Air Force - 17, 99  
DLA - ES

## User activities:

Army - AT, AV, ME  
Navy - CG, MC  
Air Force - 19

## Preparing activity:

Navy - EC

## Agent:

DLA - ES

(Project 5905-1255)



# STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

## INSTRUCTIONS

The preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the document number and revision letter should be given.

2. The submitter of this form must complete blocks 4, 5, 6, and 7.

3. The preparing activity must provide a reply within 30 days from receipt of the form.

NOTE: This form may not be used to request copies of documents, nor to request waivers, or clarification of requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements.

**I RECOMMEND A CHANGE:**

1. DOCUMENT NUMBER  
MIL-R-22C

2. DOCUMENT DATE (YYMMDD)

3. DOCUMENT TITLE

*Resistor, Variable, (Wire-wound, Power type), General Specification for*

4. NATURE OF CHANGE (Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)

5. REASON FOR RECOMMENDATION

6. SUBMITTER

a. NAME (Last, First, Middle Initial)

b. ORGANIZATION

c. ADDRESS (Include Zip Code)

d. TELEPHONE (Include Area Code)  
(1) Commercial  
(2) AUTOVON  
(If applicable)

7. DATE SUBMITTED  
(YYMMDD)

8. PREPARING ACTIVITY

a. NAME

b. TELEPHONE (Include Area Code)  
(1) Commercial

(2) AUTOVON

c. ADDRESS (Include Zip Code)

IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT:  
Defense Quality and Standardization Office  
5203 Leesburg Pike, Suite 1403, Falls Church, VA 22041-3466  
Telephone (703) 756-2340 AUTOVON 289-2340